RESEARCH ON SPECTROSCOPY, OPACITY, AND ATMOSPHERES

NASA Grant NAGW-4272

Annual Report

For the period 1 March 1996 to 28 February 1997

Principal Investigator
Robert L. Kurucz

December 1996

Prepared for
National Aeronautics and Space Administration
Washington, D.C. 20546

Smithsonian Institution
Astrophysical Observatory
Cambridge, Massachusetts 02138

The Smithsonian Astrophysical Observatory
is a member of the
Harvard-Smithsonian Center for Astrophysics

The NASA Technical Officer for this grant is Dr. Hashima Hasan, Code SR, Ultraviolet, Visible, and Gravitational Astrophysics, NASA Headquarters, Washington, DC 20546-0001.

RESEARCH ON SPECTROSCOPY, OPACITY, AND ATMOSPHERES

NASA Grant NAGW-4272
Annual Report
For the period 1 March 1996 to 28 February 1997

I spent most of the year moving my office, fighting with administrators, and moving and upgrading my computers. My books, files, and research materials were in a warehouse much of the year.

I made very little progress on atomic and molecular data. I expect to get back into production with the new year. I did upgrade Lyman alpha wing, C I, and Si I opacities in my spectrum sysnthesis program. The changes in Lyman alpha and in Si I produced increased absorption around 160 nm. The C I opacity is increased especially between Lyman alpha and beta. I have been editing NIST data files to use as input into my atomic calculations.

I did not make any new CD-ROMs but continued to distribute the 23 already made. I am setting up a workstation to serve as a Web server so that the model atmospheres, line data, and my publications will be easily available. If I can get funding I will install a CD jukebox.

I did learn a great deal about convection in model atmospheres and the shortcomings of the mixing length formulations for treating it. I corrected a numerical error in my model atmosphere program that occured in the case of weak convection, especially in A and F stars, and I recomputed several thousand convective models. I also investigated the relationship betweeen convective velocity, microturbulent velocity, and opacity that has been ignored up until now. I will produce new grids in the next year to study the effect. It also seems that it is impossible to have both (simple-minded) pulsation and (simple-minded) convection in an atmosphere at the same time because the velocities are comparable. There may be problems with model atmospheres for cepheids. I will continue to investigate.

1996 A new opacity-sampling model atmosphere program for arbitrary abundances. In IAU Symposium 176: Stellar Surface Structure, K.G. Strassmeier and J.L. Linsky, (Eds.) pp. 523-527.

1996 Rapid calculation of line opacity. To appear in Computational Astrophysics, Volume 2, Stellar Physics (ed. R. Kudritzki, D. Mihalas, K. Nomoto, and F.-K. Thielemann) Springer-Verlag, Berlin.

1996 Fundamental parameters of Cepheids. IV. Temperature and gravity. (D. Bersier, G. Burki, and R.L. Kurucz) submitted to Astronomy and Astrophysics.

1996 Status of the ATLAS12 opacity sampling program and of new programs for Rosseland and for distribution function opacity. in 'Model Atmospheres and Spectrum Synthesis', eds. S.J. Adelman, F. Kupka and W.W. Weiss, A.S.P. Conf. Proc. 108, p. ___.

1996 Model stellar atmospheres and real stellar atmospheres. in 'Model Atmospheres and Spectrum Synthesis', eds. S.J. Adelman, F. Kupka and W.W. Weiss, A.S.P. Conf. Proc. 108, p. ___.

1996 A calibration of Geneva photometry for B to G stars in terms of Teff, log g, and [M/H]. (M, Kuenzli, P. North, R.L. Kurucz, and B. Nicolet) submitted to Astronomy and Astrophysics.